



# PMZB290UN

20 V, single N-channel Trench MOSFET

20 January 2016

Product data sheet

## 1. General description

N-channel enhancement mode Field-Effect Transistor (FET) in a leadless ultra small DFN1006B-3 (SOT883B) Surface-Mounted Device (SMD) plastic package using Trench MOSFET technology.

## 2. Features and benefits

- Fast switching
- Trench MOSFET technology
- Low threshold voltage
- Ultra thin package profile with 0.37 mm height
- ElectroStatic Discharge (ESD) protection: 2 kV HBM

## 3. Applications

- Relay driver
- High-speed line driver
- Low-side loadswitch
- Switching circuits

## 4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{DS}$	drain-source voltage	$T_j = 25\text{ °C}$	-	-	20	V
$V_{GS}$	gate-source voltage		-8	-	8	V
$I_D$	drain current	$V_{GS} = 4.5\text{ V}; T_{amb} = 25\text{ °C}$	[1]	-	1	A
<b>Static characteristics</b>						
$R_{DSon}$	drain-source on-state resistance	$V_{GS} = 4.5\text{ V}; I_D = 200\text{ mA}; T_j = 25\text{ °C}$	-	290	350	m $\Omega$

[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated, mounting pad for drain 1 cm<sup>2</sup>.

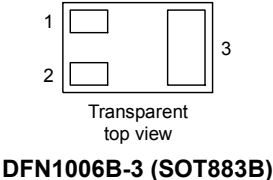
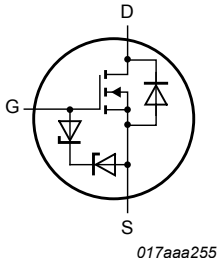


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### 5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	G	gate	 <p>Transparent top view DFN1006B-3 (SOT883B)</p>	 <p>017aaa255</p>
2	S	source		
3	D	drain		

### 6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PMZB290UN	DFN1006B-3	DFN1006B-3: leadless ultra small plastic package; 3 solder lands; body 1.0 x 0.6 x 0.37 mm	SOT883B

### 7. Marking

Table 4. Marking codes

Type number	Marking code
PMZB290UN	0000 0101

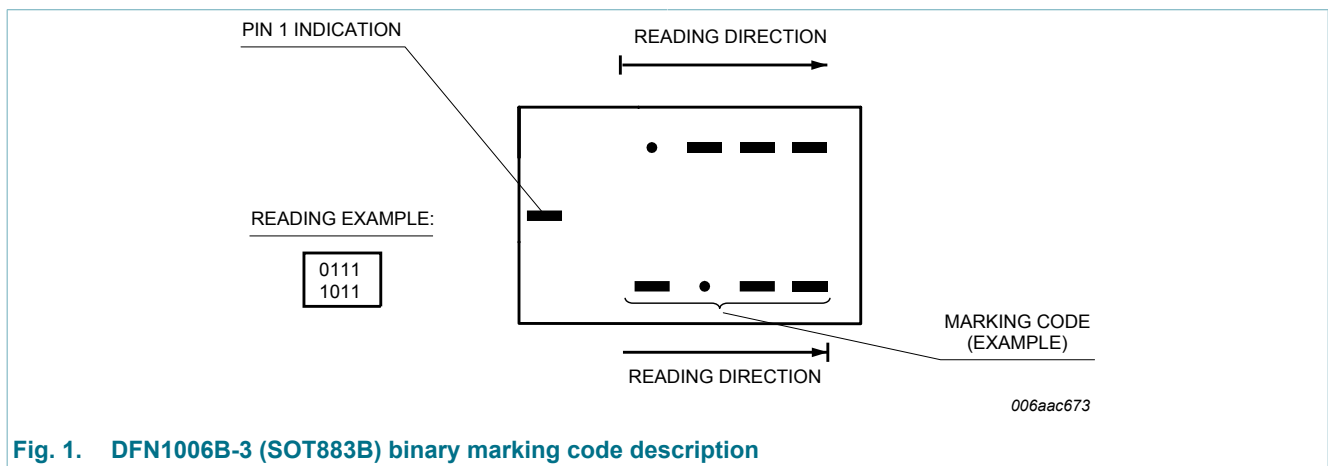


Fig. 1. DFN1006B-3 (SOT883B) binary marking code description

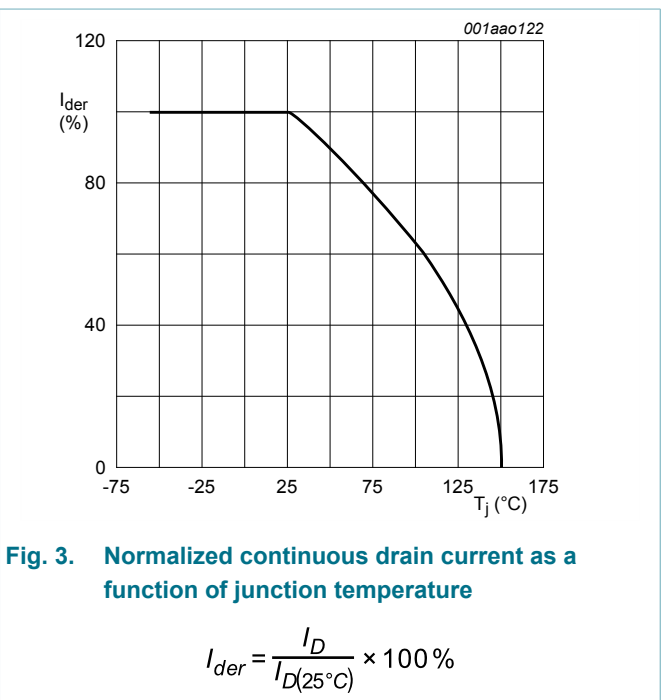
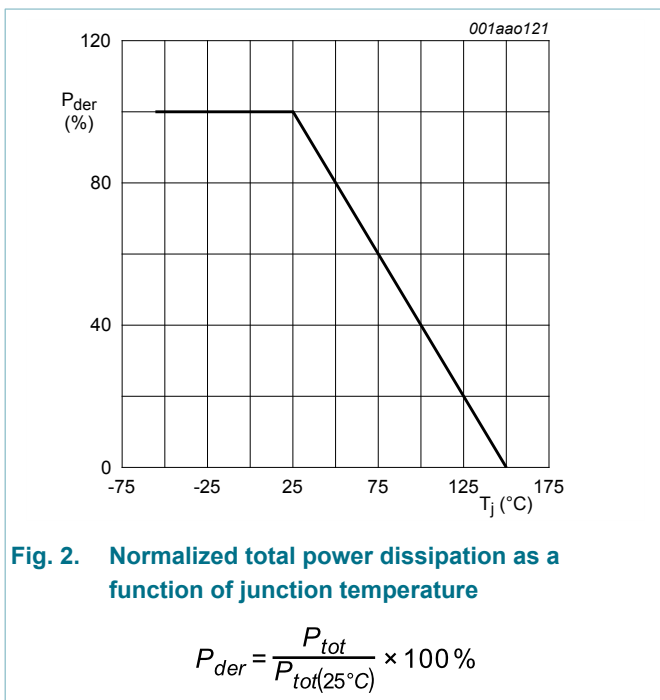
## 8. Limiting values

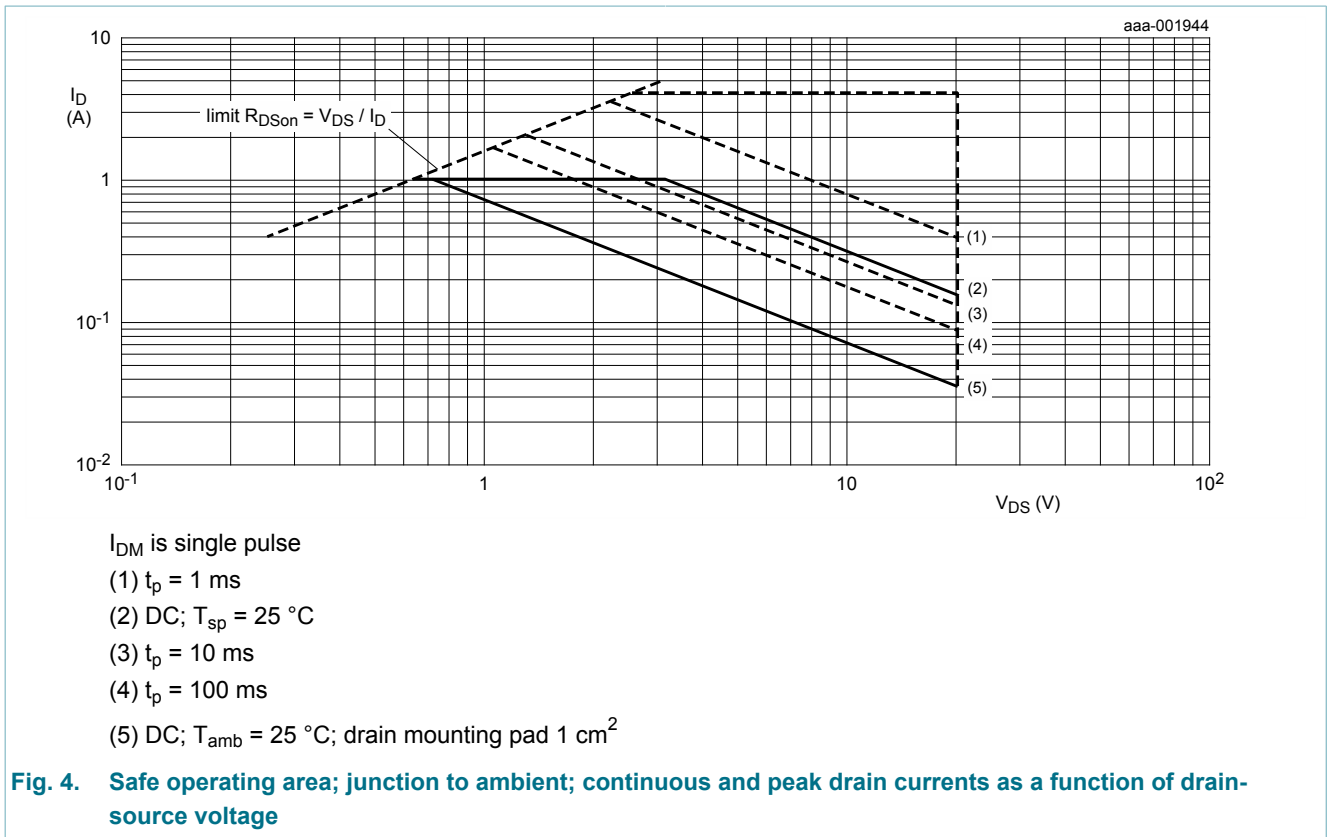
**Table 5. Limiting values**

In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions		Min	Max	Unit
V <sub>DS</sub>	drain-source voltage	T <sub>j</sub> = 25 °C		-	20	V
V <sub>GS</sub>	gate-source voltage			-8	8	V
I <sub>D</sub>	drain current	V <sub>GS</sub> = 4.5 V; T <sub>amb</sub> = 25 °C	[1]	-	1	A
		V <sub>GS</sub> = 4.5 V; T <sub>amb</sub> = 100 °C	[1]	-	0.6	A
I <sub>DM</sub>	peak drain current	T <sub>amb</sub> = 25 °C; single pulse; t <sub>p</sub> ≤ 10 μs		-	4	A
P <sub>tot</sub>	total power dissipation	T <sub>amb</sub> = 25 °C	[2]	-	360	mW
			[1]	-	715	mW
		T <sub>sp</sub> = 25 °C		-	2700	mW
T <sub>j</sub>	junction temperature			-55	150	°C
T <sub>amb</sub>	ambient temperature			-55	150	°C
T <sub>stg</sub>	storage temperature			-65	150	°C
<b>Source-drain diode</b>						
I <sub>S</sub>	source current	T <sub>amb</sub> = 25 °C	[1]	-	0.67	A

- [1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated, mounting pad for drain 1 cm<sup>2</sup>.
- [2] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.





## 9. Thermal characteristics

**Table 6. Thermal characteristics**

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	305	360	K/W
			[2]	-	150	175	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point			-	-	40	K/W

[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for drain  $1$  cm<sup>2</sup>.

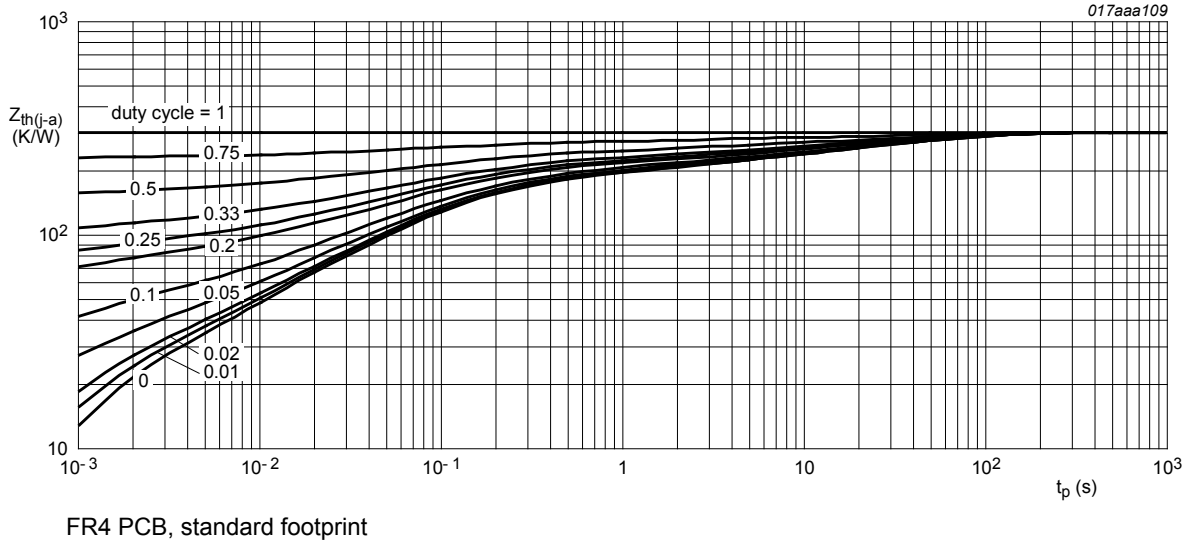


Fig. 5. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

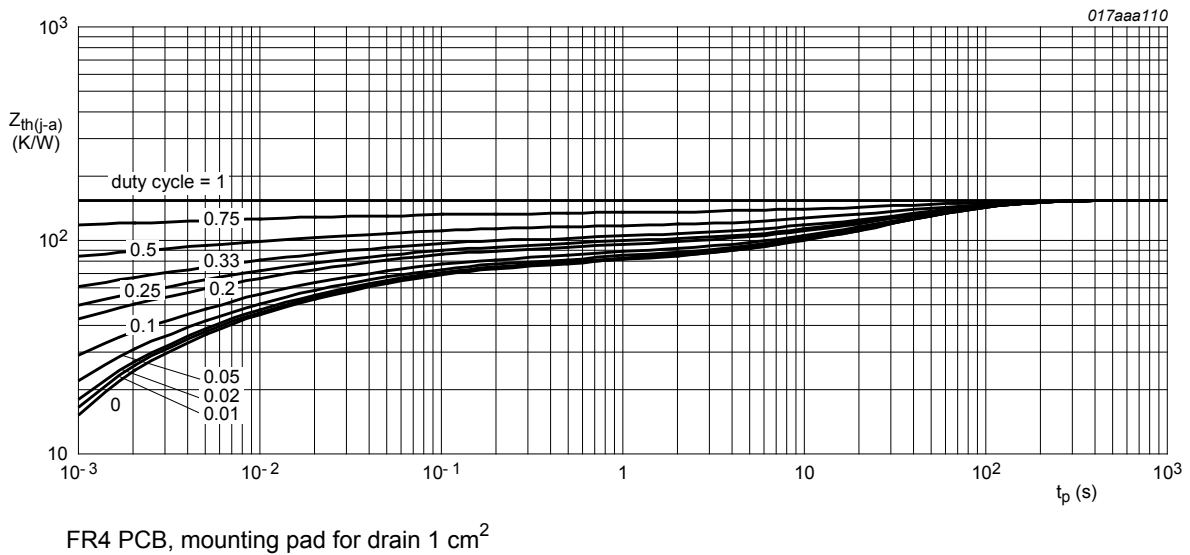
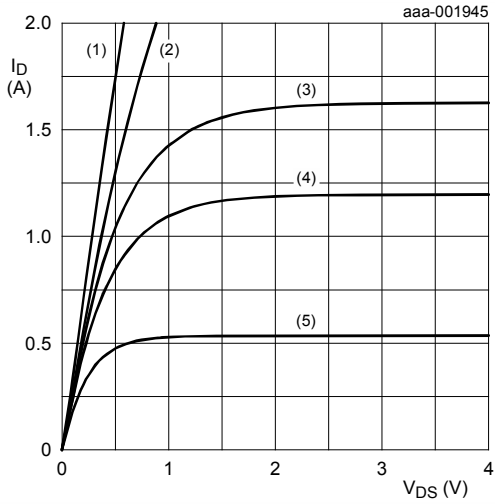


Fig. 6. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

## 10. Characteristics

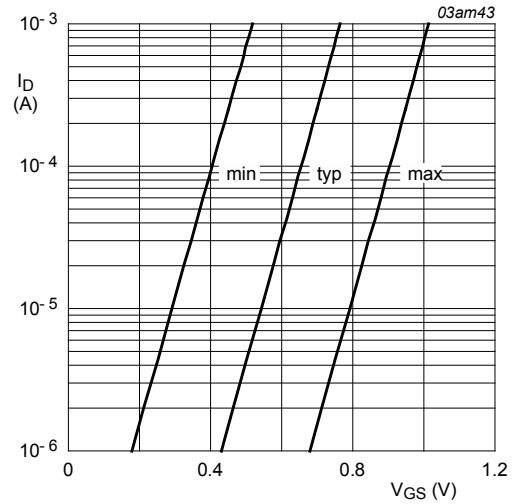
Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 10 \mu A; V_{GS} = 0 V; T_j = 25 \text{ }^\circ C$	20	-	-	V
$V_{GSth}$	gate-source threshold voltage	$I_D = 250 \mu A; V_{DS} = V_{GS}; T_j = 25 \text{ }^\circ C$	0.45	0.7	0.95	V
$I_{DSS}$	drain leakage current	$V_{DS} = 20 V; V_{GS} = 0 V; T_j = 25 \text{ }^\circ C$	-	-	1	$\mu A$
		$V_{DS} = 20 V; V_{GS} = 0 V; T_j = 150 \text{ }^\circ C$	-	-	100	$\mu A$
$I_{GSS}$	gate leakage current	$V_{GS} = 8 V; V_{DS} = 0 V; T_j = 25 \text{ }^\circ C$	-	-	5	$\mu A$
		$V_{GS} = -8 V; V_{DS} = 0 V; T_j = 25 \text{ }^\circ C$	-	-	-5	$\mu A$
		$V_{GS} = 4.5 V; V_{DS} = 0 V; T_j = 25 \text{ }^\circ C$	-	-	1	$\mu A$
		$V_{GS} = -4.5 V; V_{DS} = 0 V; T_j = 25 \text{ }^\circ C$	-	-	-1	$\mu A$
		$V_{GS} = 2.5 V; V_{DS} = 0 V; T_j = 25 \text{ }^\circ C$	-	-	100	nA
		$V_{GS} = -2.5 V; V_{DS} = 0 V; T_j = 25 \text{ }^\circ C$	-	-	-100	nA
		$R_{DSon}$	drain-source on-state resistance	$V_{GS} = 4.5 V; I_D = 200 \text{ mA}; T_j = 25 \text{ }^\circ C$	-	290
$V_{GS} = 4.5 V; I_D = 200 \text{ mA}; T_j = 150 \text{ }^\circ C$	-	460		560	m $\Omega$	
$V_{GS} = 2.5 V; I_D = 100 \text{ mA}; T_j = 25 \text{ }^\circ C$	-	360		450	m $\Omega$	
$V_{GS} = 1.8 V; I_D = 75 \text{ mA}; T_j = 25 \text{ }^\circ C$	-	460		650	m $\Omega$	
$g_{fs}$	forward transconductance	$V_{DS} = 5 V; I_D = 200 \text{ mA}; T_j = 25 \text{ }^\circ C$	-	5.8	-	S
<b>Dynamic characteristics</b>						
$Q_{G(tot)}$	total gate charge	$V_{DS} = 10 V; I_D = 1 A; V_{GS} = 4.5 V; T_j = 25 \text{ }^\circ C$	-	0.89	1.2	nC
$Q_{GS}$	gate-source charge		-	0.13	-	nC
$Q_{GD}$	gate-drain charge		-	0.18	-	nC
$C_{iss}$	input capacitance	$V_{DS} = 20 V; f = 1 \text{ MHz}; V_{GS} = 0 V; T_j = 25 \text{ }^\circ C$	-	45	68	pF
$C_{oss}$	output capacitance		-	11	-	pF
$C_{rss}$	reverse transfer capacitance		-	7	-	pF
$t_{d(on)}$	turn-on delay time	$V_{DS} = 10 V; R_L = 10 \Omega; V_{GS} = 4.5 V; R_{G(ext)} = 6 \Omega; T_j = 25 \text{ }^\circ C$	-	4.5	9	ns
$t_r$	rise time		-	10	-	ns
$t_{d(off)}$	turn-off delay time		-	18.5	37	ns
$t_f$	fall time		-	5	-	ns
<b>Source-drain diode</b>						
$V_{SD}$	source-drain voltage	$I_S = 300 \text{ mA}; V_{GS} = 0 V; T_j = 25 \text{ }^\circ C$	-	0.75	1.2	V



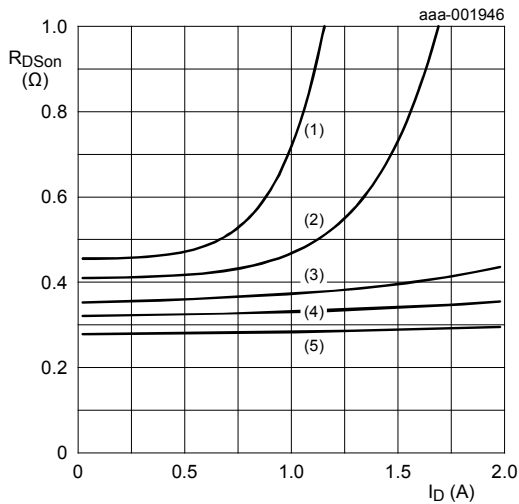
$T_j = 25\text{ }^\circ\text{C}$   
 (1)  $V_{GS} = 4.5\text{ V}$   
 (2)  $V_{GS} = 2.5\text{ V}$   
 (3)  $V_{GS} = 2.0\text{ V}$   
 (4)  $V_{GS} = 1.8\text{ V}$   
 (5)  $V_{GS} = 1.5\text{ V}$

**Fig. 7. Output characteristics: drain current as a function of drain-source voltage; typical values**



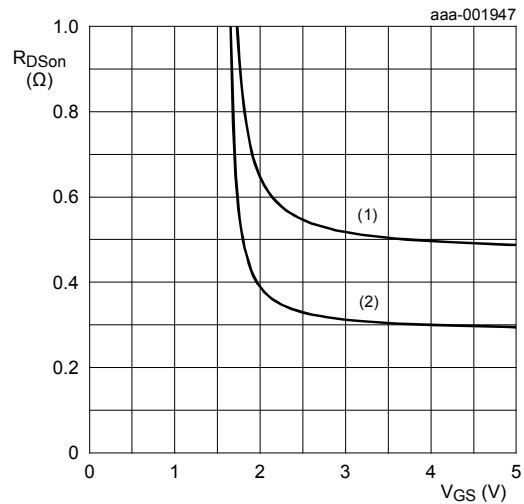
**Fig. 8. Sub-threshold drain current as a function of gate-source voltage**

$T_j = 25\text{ }^\circ\text{C}; V_{DS} = 5\text{ V}$



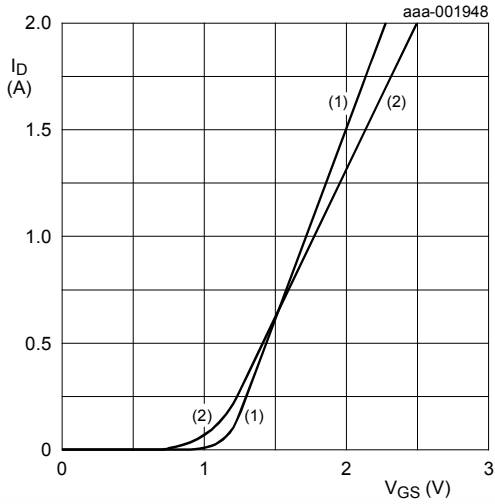
$T_j = 25\text{ }^\circ\text{C}$   
 (1)  $V_{GS} = 1.8\text{ V}$   
 (2)  $V_{GS} = 2\text{ V}$   
 (3)  $V_{GS} = 2.5\text{ V}$   
 (4)  $V_{GS} = 3\text{ V}$   
 (5)  $V_{GS} = 4.5\text{ V}$

**Fig. 9. Drain-source on-state resistance as a function of drain current; typical values**



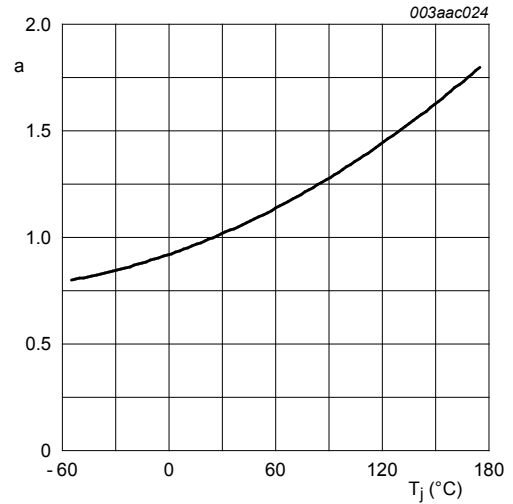
$I_D = 800\text{ mA}$   
 (1)  $T_j = 150\text{ }^\circ\text{C}$   
 (2)  $T_j = 25\text{ }^\circ\text{C}$

**Fig. 10. Drain-source on-state resistance as a function of gate-source voltage; typical values**



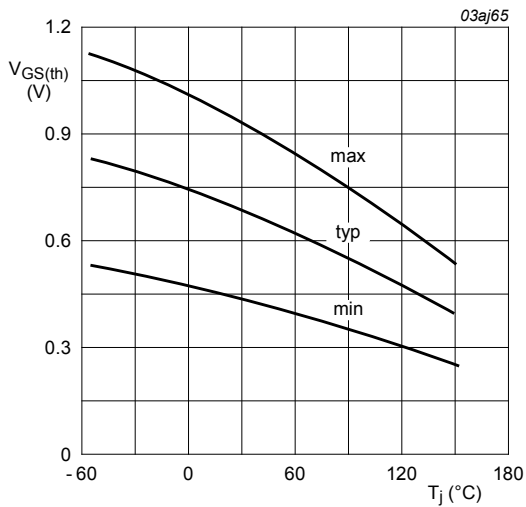
$V_{DS} > I_D \times R_{DSon}$   
 (1)  $T_j = 25\text{ °C}$   
 (2)  $T_j = 150\text{ °C}$

**Fig. 11. Transfer characteristics: drain current as a function of gate-source voltage; typical values**



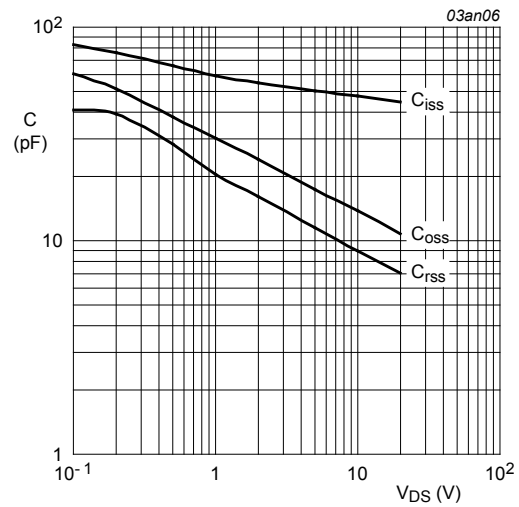
**Fig. 12. Normalized drain-source on-state resistance as a function of junction temperature; typical values**

$$a = \frac{R_{DSon}}{R_{DSon(25\text{°C})}}$$



$I_D = 0.25\text{ mA}; V_{DS} = V_{GS}$

**Fig. 13. Gate-source threshold voltage as a function of junction temperature**



**Fig. 14. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values**

$V_{GS} = 0V; f = 1MHz$



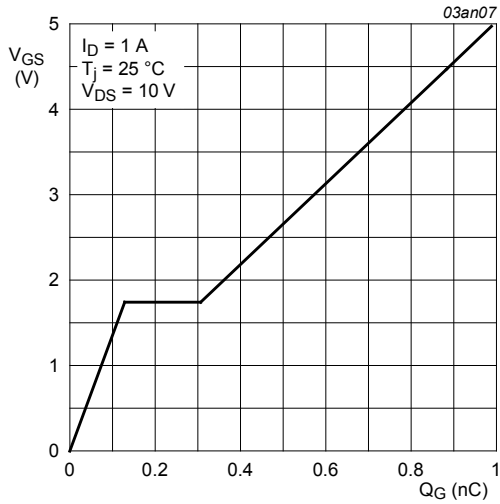


Fig. 15. Gate-source voltage as a function of gate charge; typical values

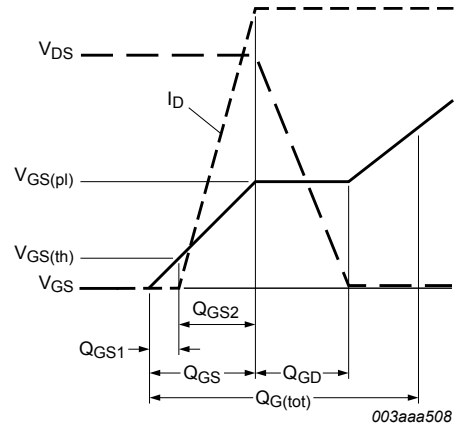
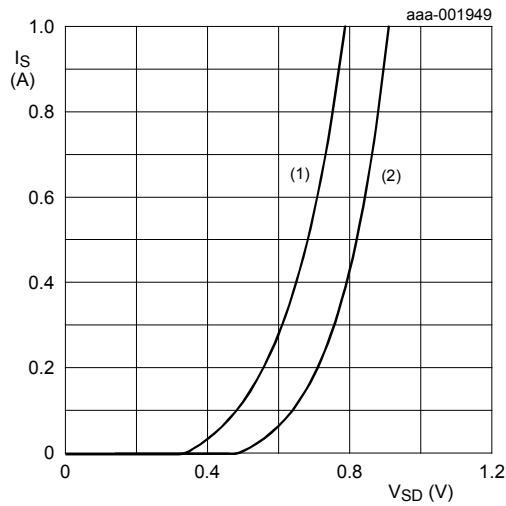


Fig. 16. Gate charge waveform definitions



$V_{GS} = 0\text{ V}$   
 (1)  $T_j = 150\text{ }^\circ\text{C}$   
 (2)  $T_j = 25\text{ }^\circ\text{C}$

Fig. 17. Source current as a function of source-drain voltage; typical values

### 11. Test information

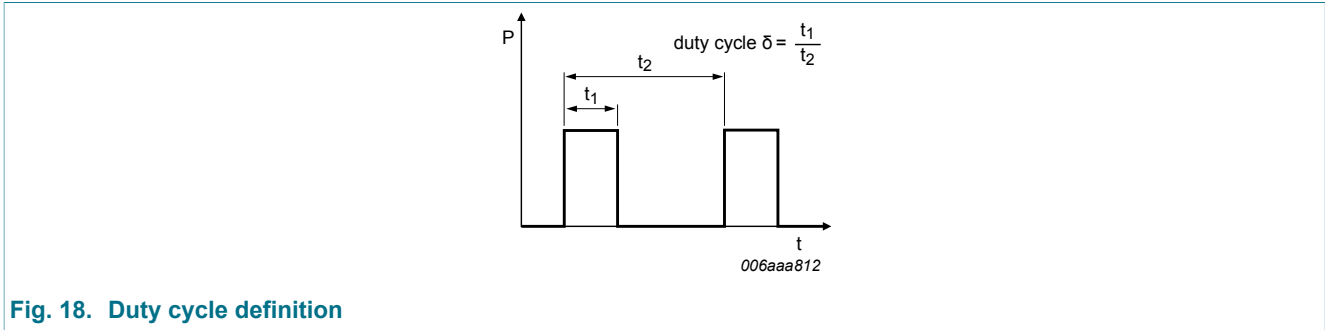


Fig. 18. Duty cycle definition

### 12. Package outline

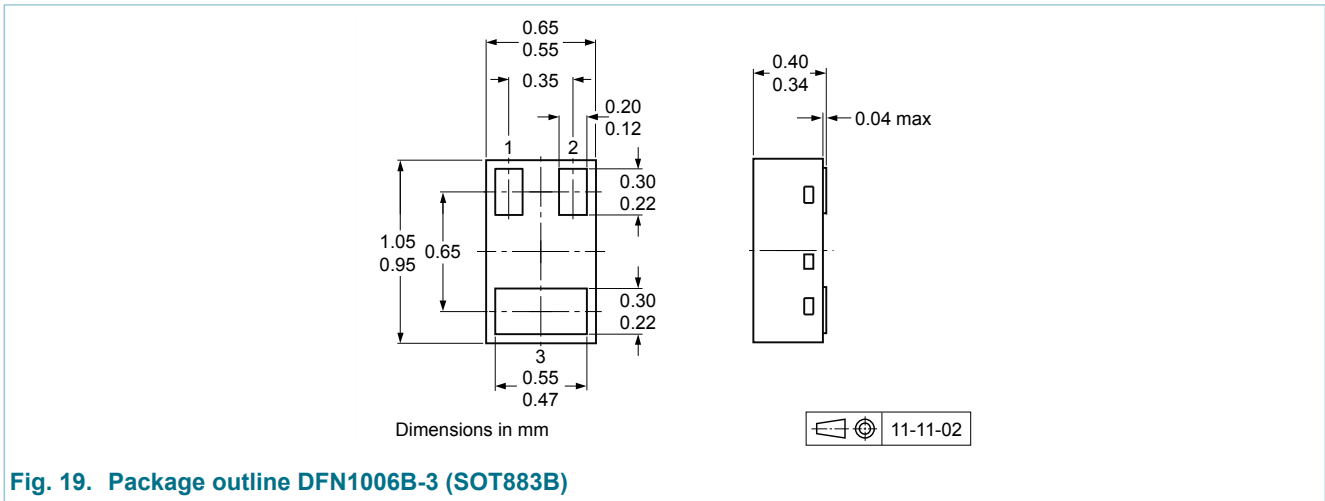


Fig. 19. Package outline DFN1006B-3 (SOT883B)

### 13. Soldering

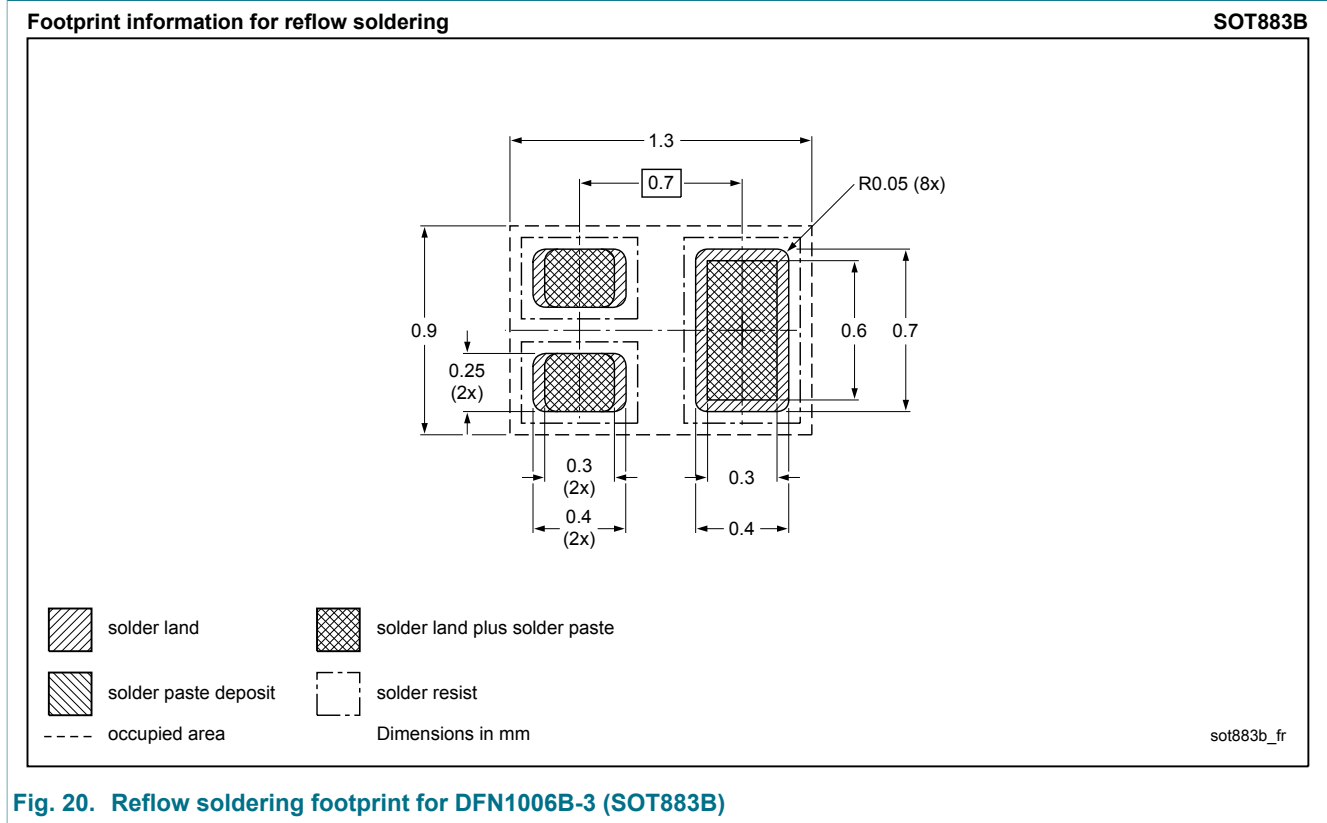


Fig. 20. Reflow soldering footprint for DFN1006B-3 (SOT883B)

## 14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PMZB290UN v.2	20160120	Product data sheet	-	PMZB290UN v.1
Modifications:	<ul style="list-style-type: none"><li>values for gate leakage current and forward transconductance changed</li></ul>			
PMZB290UN v.1	20120511	Product data sheet	-	-

## 15. Legal information

### 15.1 Data sheet status

Document status [1][2]	Product status [3]	Definition
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Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

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- [2] The term 'short data sheet' is explained in section "Definitions".
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Date of release: 20 January 2016